# Is it or isn't it? Pentaquark debate heats up

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New data from the Department of Energy's Jefferson Lab shows the pentaquark doesn't appear in one place it was expected. The result contradicts earlier findings in this same region and adds to the controversy over whether research groups from around the world have caught a glimpse of the so-called pentaquark, a particle built of five quarks.

Researchers in Jefferson Lab's CEBAF Large Acceptance Spectrometer (CLAS) collaboration took data with a high energy photon beam on a liquid hydrogen target. In a similar experiment conducted by the SAPHIR collaboration at the ELectron Stretcher Accelerator (ELSA) in Bonn, Germany, a signal revealing a pentaquark was observed. However, the Jefferson Lab team, whose data contained two orders of magnitude better statistics, found no evidence of the pentaquark. Raffaella De Vita, a staff scientist at Italy's Istituto Nazionale di Fisica Nucleare in Genova and a Jefferson Lab CLAS collaboration member, presented the preliminary results in a post-deadline talk at the American Physical Society's (APS) April Meeting, Session B4 on April 16.

What the Jefferson Lab CLAS collaboration data shows is that in this particular channel there is no pentaquark at a level of precision at least 50 times higher than the published SAPHIR result. The CLAS researchers in this analysis will take another round of data in 2006 to look for the pentaquark in a different channel and at higher energies.

Jefferson Lab researchers are currently in the midst of several dedicated hunts for the pentaquark, including an experiment repeating Jefferson

Lab's original pentaquark search with much higher statistics. That data is still being analyzed, and researchers expect to present the results later this year.

The first pentaquark sighting was announced by SPring-8 researchers in the spring of 2003, and the same year, Jefferson Lab, ITEP and ELSA researchers announced that they, too, may have spotted tantalizing hints of the particle in data previously taken in other experiments. For instance, the SAPHIR collaboration's evidence of the Theta-plus pentaquark came from data they took in 1997/98 and indicated a pentaquark mass of 1540 MeV (million electron volts). Several experiments since then have backed up these early sightings, while others have failed to confirm the sightings.

Most ordinary matter is built of quarks. They're usually found in twos (as particles called mesons) and threes (as particles called baryons, such as protons and neutrons). While the pentaquark's five-quark configuration is not forbidden by the theory of the strong interaction, finding one would be the first sighting of an exotic baryon.

Source: DOE/Thomas Jefferson National Accelerator Facility